3GPP TSG RAN WG2 Meeting #115-e draft R2-2109129

**Electronic meeting, 16th-27th August 2021**

**Agenda item:** 8.12.2.1

**Source:** Intel Corporation

**Title:** Summary of [AT115-e][109][RedCap] Capabilities (Intel)-2nd round

**Document for:**  Discussion and decision

# Introduction

This document is the summary of following offline discussion:

* [AT115-e][109][RedCap] Capabilites (Intel)

Initial scope: Continue the discussion on p5, p6, p8-p13, p16-p18 (p19-p20 can be discussed during the running CR drafting). In general discuss whether, for (some of) these proposals, we need to ask anything to RAN1. Also discuss p1 and p2 from [R2-2107677](file:///C:\Data\3GPP\Extracts\R2-2107677%20Constraining%20of%20reduced%20capabilities.docx), i.e. need to send an LS to SA2/CT1

Intended outcome: Summary of the offline discussion with e.g.:

* + - List of proposals for agreement (if any)
    - List of proposals that require online discussions
    - List of proposals that should not be pursued (if any)

Initial deadline (for companies' feedback): Monday 2021-08-23 10:00 UTC

Initial deadline (for rapporteur's summary in [R2-2108891](file:///C:\Data\3GPP\RAN2\Inbox\R2-2108891.zip)): Monday 2021-08-23 16:00 UTC

Proposals marked "for agreement" in [R2-2108891](file:///C:\Data\3GPP\RAN2\Inbox\R2-2108891.zip) not challenged until Tuesday 2021-08-24 0800 UTC will be declared as agreed via email by the session chair (for the rest the discussion will further continue online).

Final scope: Continue the discussion on p3, p13 and p14 from [R2-2108891](file:///C:\Data\3GPP\RAN2\Inbox\R2-2108891.zip) and draft the LS to RAN1 on L2 buffer size reduction

Intended outcome: LS(s) and summary of the offline discussion with e.g.:

* + - List of proposals for agreement (if any)
    - List of proposals that require online discussions

Final deadline (for companies' feedback): Thursday 2021-08-26 1000 UTC

Final deadline (for rapporteur's summary in R2-2109129 and LS in R2-2109130): Thursday 2021-08-26 1500 UTC

Proposals marked "for agreement" in R2-2109129 not challenged until Friday 2021-08-27 0300 UTC will be declared as agreed via email by the session chair (for the rest the discussion might continue online during the CB session).

# Discussion

Based on [12], RAN2 discussed the supported capabilities for RedCap UE and how to capture them into specification. Following agreements have been made:

Agreements:

1. The number of DRBs supported by RedCap UEs is less than legacy value (which is 16). There will be a single mandatory value (FFS if 4 or 8). FFS if it will be possible to have an optional capability
2. “RRC processing delay” is not relaxed for RedCap UE
3. PDCP/RLC AM 12 bits SN is mandatory for RedCap UE, and PDCP/RLC AM 18bits SN is optional supported by RedCap UE; FFS on how to capture this in specification
4. NE-DC, and (NG)EN-DC are not supported by RedCap UE; FFS on how to capture it in the specification
5. DAPS and CAPC related capabilities are not applicable for RedCap UE; [8/20] FFS on CHO. FFS on how to capture this in the specification;

Based on [15], following agreements have been made:

Agreements via email - from offline 109:

1. Maximum 8 DRBs is mandatory supported by RedCap UEs.
2. From RAN2 perspective, inter RAT mobility related capabilities are applicable for RedCap UE;
3. From RAN2 perspective, measurement related capabilities are applicable for RedCap UE;
4. From RAN2 perspective, URLLC related capabilities are applicable for RedCap UE except those affected by CA/DC;
5. From RAN2 perspective, IAB related capabilities are not applicable for RedCap UE, i.e. the RedCap UE is not expected to act as IAB node;
6. Do not introduce capability signalling on the supported Rx number for RedCap UE since the number of Rx branches for RedCap is implicitly indicated by the corresponding capability parameter maxNumberMIMO-LayersPDSCH in the existing UE capability framework;

Following proposals will be treated in this offline discussion based on the guidance from Chair:

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| Proposal 3. [To discuss] [11/22] on whether to introduce an optional capability to indicate the number of DRBs that the RedCap can additionally support.   * Continue in offline 109   Proposal 13. [To discuss] [6/17] whether RAN2 needs to send LS to RAN1/4 asking them to check features, URLLC, measurement, V2X, IAB, positioning   * Continue in offline 109   Proposal 14. [To discuss] [9/19] Send LS to SA2/CT1 to check subscription solution, and whether core network should know that the UE is a RedCap UE.   * Continue in offline 109 * Send an LS to RAN1 (contact Intel & Spreadtrum) asking to discuss L2 buffer size reduction and provide feedback to RAN2 |

## Max DRB number

The discussion situation is

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| RAN2 has agreed “1. Maximum 8 DRBs is mandatory supported by RedCap UEs.”  In phase 1 discussion:  **Summary on Discussion point 2.1.2-2 on max DRB number.**  22 companies provided inputs to this discussion point:  **Introduce the optional capability to indicate the number of DRBs that the RedCap can additionally support**   * + **Yes**: 11 companies (ZTE, Qualcomm, Apple, BT, vivo, Sequans, Turkcell, MediaTek, LGE, Deutsche Telekom, OPPO )   Companies who support to introduce optional capability would like to allow high-end UE and offer more flexibility to implementation;   * + **No:** 10 companies (Intel, Huawei, Spreadtrum, CMCC, Ericsson, CATT, NEC, Telecom Italia, Nokia, Samsung )   Futurewei commented that *if 8 is selected as the mandatory value, no optional capability is needed.*    **Rapporteur**: There is no clear majority on whether optional capability should be introduced for RedCap UE. Rapporteur would suggest to postpone the discussion.  Proposal 3. [To discuss] [11/22] on whether to introduce an optional capability to indicate the number of DRBs that the RedCap can additionally support.   * Continue in offline 109 |

Considering RAN2 has agreed 8 is mandatory value, do companies still see the value to introduce optional capability to indicate the support of 16 DRBs? .Rapporteur would like to check companies’ view again,

**Discussion point 2.1.2 on max DRB number: Companies are invited to provide view on whether to introduce the optional capability to indicate the support of 16 DRBs for RedCap UEs?**

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| **Company’s name** | **Yes/No** | **Comments, if any** |
| Intel | No | 8 is sufficient for RedCap UE. |
| Apple | Yes | We should not shortchange all RedCap UEs. Wearable can have similar applications as legacy NR UEs and adding a blanket to all RedCap UEs is ineffective. |
| BT | Yes | We consider 8 DRBs are enough for RedCap UEs but we don’t want to reduce flexibility. At the end, it is up to how the network is engineered to support more than 8 DRBs in case this is accepted. |
| OPPO | Yes | For most RedCap use cases, 8 DRBs are sufficient. Introducing optional capability for support of 16 DRBs could provide more flexibility for UE implementation. |
| Huawei, HiSilicon | No | 16 will be not really useful to RedCap UE. In addition, single value will make the gNB implementation simple, just like legacy. |
| Vivo | No | We think 8 is sufficient for all RedCap use cases. |
| MediaTek | Yes | Agree for the same reasons as Apple. |
| Samsung | No | We also think that 8 would be enough. |
| Futurewei | No | 8 should be enough. |
| Sequans | Yes | Prefer to have the flexibility of a second value of 16 DRBs.  Since gNBs today are already working with 16 DRBs and per UE this number has no reason to change, isn’t most of the complexity in introducing the 8 DRBs anyway? However, with 8 DRBs as the minimum, we are OK to go with majority. |
| T-Mobile USA | YES | There are cases in T-Mobile’s deployment were more that 8 DRB’s are required. We would like to see an option to support 16. |
| Qualcomm | Yes | Agree with Apple |
| LGE | Yes | Agree with Apple |
| ZTE | Yes | Agree with Apple |
| Nokia | No | We are happy to agree support for more than 8 DRBs if use case for it is clarified. |
| Ericsson | No | Tend to agree with HW view. However, if there is option between 8 or 16 a capability is a must. |

**Summary on Discussion point 2.1.2 on max DRB number.**

## LS to RAN1, RAN4

The discussion situation is:

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| **Discussion point 2.3-1 on LS to RAN1 and RAN4: Companies are invited to provide view on whether RAN2 needs to send LS to RAN1/4, ask them to check features, URLLC, measurement, V2X, IAB, positioning ? If yes, please indicate which feature should be included in the LS.**  **Summary on the Discussion point 2.3-1 on LS to RAN1 and RAN4**  17 companies provided inputs to this discussion point.   * **Need of LS to RAN1/4:**   **Yes**: 6 companies (Spreadtrum, ZTE, Apple, Squans, NEC, OPPO )  **No:** 2 companies (Intel, vivo , )  **Postpone:** 7 companies (Qualcomm, Ericsson, Turkcell, MediaTek, LGE, Nokia, Samsung)  Qualcomm mentioned RAN1 is discussing these issues, and we can wait for their agreements.  **Rapporteur**: There is no consensus on the need of LS. As Qualcomm commented “RAN1 is discussing these issues”, Rapporteur tend to think no LS is needed at least for now.  Proposal 13. [To discuss] [6/17] whether RAN2 needs to send LS to RAN1/4 asking them to check features, URLLC, measurement, V2X, IAB, positioning   * Continue in offline 109 |

As commented by Qualcomm RAN1 is discussing these issues, then should we still need to send LS to trigger the discussion in RAN1 and RAN4? Or we just postpone the discussion, and may send LS based on the situation. Rapporteur would like to check companies’ view again.

**Discussion point 2.2 on LS to RAN1 and RAN4: Companies are invited to provide view on whether RAN2 needs to send LS to RAN1/4, ask them to check features, URLLC, measurement, V2X, IAB, positioning ?**

* **Option 1: send the LS in this meeting;**
* **Option 2: postpone the LS, and only send LS when needed, e.g. check the situation in RAN1 and RAN4 in next meeting;**

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| **Company’s name** | **Option 1 or option 2** | **Comments, if any** |
| Intel | Option 2 | Let’s see the discussion in RAN1 and RAN4 first. Can come back in next meeting. |
| Apple | No strong view. Ok with majority. |  |
| BT | Option 2 | RAN2 can wait to see RAN1 evolution |
| OPPO | Option 1 | We notice that RAN1 is not discussing all these features, so maybe an LS is needed and all features (URLLC, measurement, V2X, IAB, positioning) can be included. |
| Huawei, HiSilicon | Option 2, or? | The LS seems not essential. But we are fine if the LS is just copy RAN2 agreements:   1. From RAN2 perspective, inter RAT mobility related capabilities are applicable for RedCap UE; 2. From RAN2 perspective, measurement related capabilities are applicable for RedCap UE; 3. From RAN2 perspective, URLLC related capabilities are applicable for RedCap UE except those affected by CA/DC; 4. From RAN2 perspective, IAB related capabilities are not applicable for RedCap UE, i.e. the RedCap UE is not expected to act as IAB node;   To be honest, RAN1 will check the feature by their own anyway. Maybe it is also another option that we just copy all the R2 agreements this meeting to RAN1, not limited to this AI, but cover all the RedCap items. |
| vivo | Option 2 | We think RAN1 and RAN4 have been involved in the WID. It is their task to discuss all these. As far as I know, they have already initiated the related discussion by themself. We donot see the need to inform them by now.  We could further check their discussion progress in next meeting. |
| MediaTek | Option 2 | We do not see a strong justification to send this information to RAN1. There is no action that needs to be taken by RAN1 based on this input. |
| Samsung | Option 2 |  |
| Futurewei | Option 2 |  |
| Sequans | Option 2, but | We are fine to send an LS with RAN2 capabilities-related agreements or postpone and wait to see RAN1 input next meeting. |
| Qualcomm | Option 2 |  |
| LGE | Option 2 |  |
| ZTE | Option 1 | RAN1 is not discussing these UE capabilities during this meeting, so how could we receive inputs before next RAN2 meeting? |
| Nokia | Option 2 |  |
| Ericsson | Option 1 | Agree with the comments that RAN1 is not discussing these features related to RedCap UE capabilities, therefore we support sending an LS if we want some specific replies. |

**Summary on the Discussion point 2.2 on LS to RAN1 and RAN4**

xx companies provided inputs to this discussion point.

* **Option 1: send the LS in this meeting;**
* **Option 2: postpone the LS, and only send LS when needed, e.g. check the situation in RAN1 and RAN4 in next meeting;**

## Constrain the use of RedCap

The discussion situation is

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| **Summary on the Discussion point 2.3-1 on LS to SA2, CT1**  19 companies provided inputs to this discussion point.   * **Need of LS to SA2/CT1:**   **Yes**: 9 companies (Intel, Spreadtrum, ZTE, Qualcomm, CMCC, vivo, NEC, Telecom Italia, Deutsche Telekom )  **No:** 10 companies (Huawei, Apple, Sequans, Ericsson, Turkcell, MediaTek, LGE, Nokia, OPPO, Samsung)  Companies who do not want to send LS believe SA2/CT1 can initiate the discussion directly.  **Rapporteur**: The different between LS to RAN1/4 and LS to SA2/CT1 is, RAN1/4 is responsible for RedCap WI and RAN1 is discussing the same issues. But SA2/CT1 are out of RedCap WI. Any work in SA2/CT1 should be triggered based on LS.  Proposal 14. [To discuss] [9/19] Send LS to SA2/CT1 to check subscription solution, and whether core network should know that the UE is a RedCap UE.   * Continue in offline 109 |

As mentioned in phase 1 summary, the difference between LS to RAN1/4 and LS to SA2/CT1 is, RAN1/4 is responsible for RAN WI RedCap and RAN1 is discussing the same issues. But SA2/CT1 are out of RedCap WI. They are still discussing whether a WI is needed to handle eDRX issue. RedCap related discussion in SA2/CT1 is triggered by RAN LS.

**Discussion point 2.3 on LS to SA2, CT1: Companies are invited to provide view on whether Send LS to SA2/CT1 to ask question “whether core network should know that the UE is a RedCap UE”?**

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| **Company’s name** | **Yes/No** | **Comments, if any** |
| Intel | Yes | We have to trigger the discussion in SA2/CT1 since they are not in WI scope. |
| Apple | No | CT1/SA2 is already discussing the signaling between RAN and CN, and anyway eDRX and UAC LS already triggered the discussion on NAS signaling. We think there is no need to remind them about the CN knowing whether the UE is a redcap UE. |
| BT | Yes | It is required to inform SA2/CT1 that RedCap has 1Rx and 2Rx. As mentioned by Intel, 1Rx and 2Rx is not in the WI description therefore SA2/CT1 need to be notified. |
| OPPO | No | Agree with Apple. |
| Huawei, HiSilicon | No | As to the rapporteur’s statement “They are still discussing whether a WI is needed to handle eDRX issue. RedCap related discussion in SA2/CT1 is triggered by RAN LS.”  Please note SA2 is going to approve their own WID this week, see S2-2106148, where the asked question will be included.  It seems no need to trigger their discussion by LS. |
| vivo | Yes | We think we should inform SA2/CT1 about our discussion on this part to imitate their work. |
| MediaTek | No | Agree with Apple |
| Samsung | No | Agree with Apple and Huawei. |
| Futurewei | No | Agree with Apple and Huawei. |
| Sequans | No | Agree with HW. As with previous question, we can wait one meeting to see the natural advancement in SA. |
| T-Mobile USA | Yes | Agree with BT’s comment |
| Qualcomm | Yes | Agree with Intel |
| LGE | No | Agree with Apple and Huawei |
| ZTE | Yes |  |
| Nokia | No |  |
| Ericsson | Yes | We agree SA2 has discussed some aspects of RedCap already, but we think it is best to send LS specifically on this topic to trigger any further discussion and get feedback on their possible agreements. |

**Summary on the Discussion point 2.3 on LS to SA2, CT1**

# Summary report and proposals

Aiming to help with the meeting discussion/progress, the proposals are categorized starting with:

* [To agree] when there is large support and hence proposed for easy agreement.
* [To discuss] when there is substantial level of support and agreement may be possible.
* [FFS] when there is low support or companies propose new solutions or options to possibly consider further e.g. if there is sufficient support (understanding that these topic have not been discussed by all companies when providing their views in the different discussion points).

The proposals also start with a number: for the format [x], ‘x’ represents the number of supportive companies (i.e. these solutions are marked as FFS as the proposed solutions were not discussed by all companies) and, for the format [x/y], ‘x’ represents the number of supportive companies, and (y-x) the number of companies with different view.

The observations captured are the following:

**Observation 1.** xxxx.

The proposals captured are the following:

**Proposal 1.**

The following list shows the proposals above organized based on the suggested priority aiming to help during its meeting discussion:

**Proposals for easy agreement**

**Proposals for discussion (1st priority) or to be captured as FFS**

**Proposals for discussion (2nd priority) or to be captured as FFS**

# Annex: companies’ point of contact

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| --- | --- | --- |
| **Company** | **Point of contact** | **Email address** |
| Intel Corporation | Yi Guo | Yi.guo@intel.com |
| Apple | Naveen Palle | naveen.palle@apple.com |
| BT | Salva Diaz | salva.diazsendra@bt.com |
| OPPO | Haitao Li | lihaitao@oppo.com |
| Huawei, HiSilicon | Yulong Shi | shiyulong5@huawei.com |
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| T-Mobile USA | John Humbert | John.Humbert2@T-Mobile.com |
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# Reference

1. R2-2106462 Summary 8.12.2.1 - Definition of RedCap UE and reduced capabilities (Intel)
2. R2-2106521 [offline 105] Definition of RedCap UE and reduced capabilities (Intel) Intel
3. R2-2106528 [offline 105] Definition of RedCap UE and reduced capabilities - second round Intel
4. TR 38.875
5. RP-210918, “Revised WID on support of reduced capability NR devices”
6. R2-2102017 Summary of offline 107 - [REDCAP] L2 capabilties and UE types Huawei
7. R2-2105234 Definition of RedCap UE and first look on capability signaling Ericsson
8. R2-2105634 Definition of RedCap UE type and reduced capabilities Huawei, HiSilicon
9. R2-2104927 RedCap UE capability and constraining of reduced capabilities Intel Corporation
10. TS 38.306 g40
11. TS 38.331 g41
12. R2-2107676 Email discussion report on [105][RedCap] Capabilities (Intel) Intel Corporation
13. R1-2108316 FL summary #1 on other aspects of UE complexity reduction for RedCap Moderator (Intel Corporation)
14. [R2-2107677](file:///C:\Data\3GPP\Extracts\R2-2107677%20Constraining%20of%20reduced%20capabilities.docx) Constraining network access for UE with reduced capabilities Intel Corporation
15. R2-2108891 [offline 109] RedCap capabilities Intel
16. R2-2109103 WF on Rel-17 RedCap L2 soft buffer Reduction Spreadtrum, Apple, CAICT, CEPRI, CMCC, CTC, CUC, GDCNI, Guangdong Genius, OPPO, Sequans, Xiaomi, u-blox AG, vivo, ZTE, Sanechips